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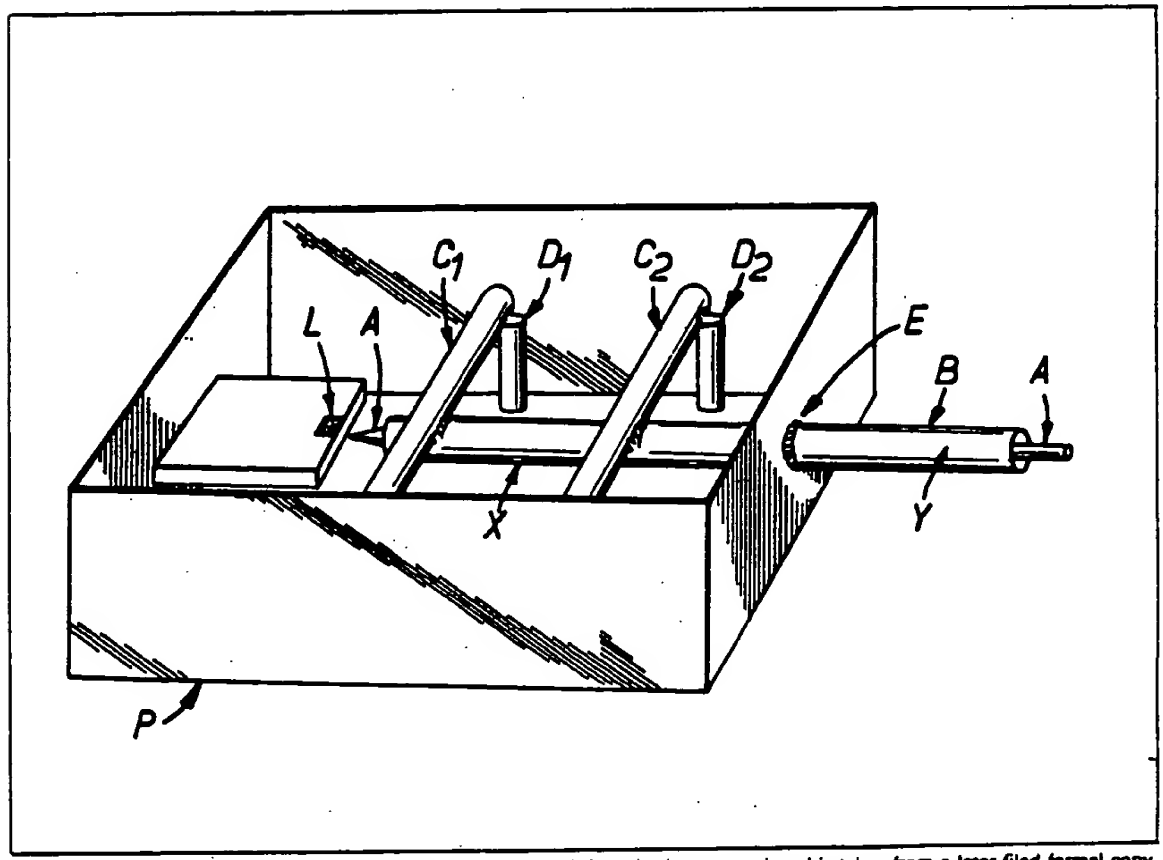
(54) Positioning an optical fibre relative to an opto-electronic device

(57) An optical fibre A is aligned extremely accurately with an opto-electronic device, such as a laser L by securing the fibre within a metallic tube B and securing the metal tube to a cross arm C, manoeuvring the cross arm between two fixed posts D to give the optimum light output and soldering the cross arm to the posts to produce a rigid structure which is suitable for a hermetically sealed device. The tube B may be held by a micromanipulator at point X and then point Y during positioning.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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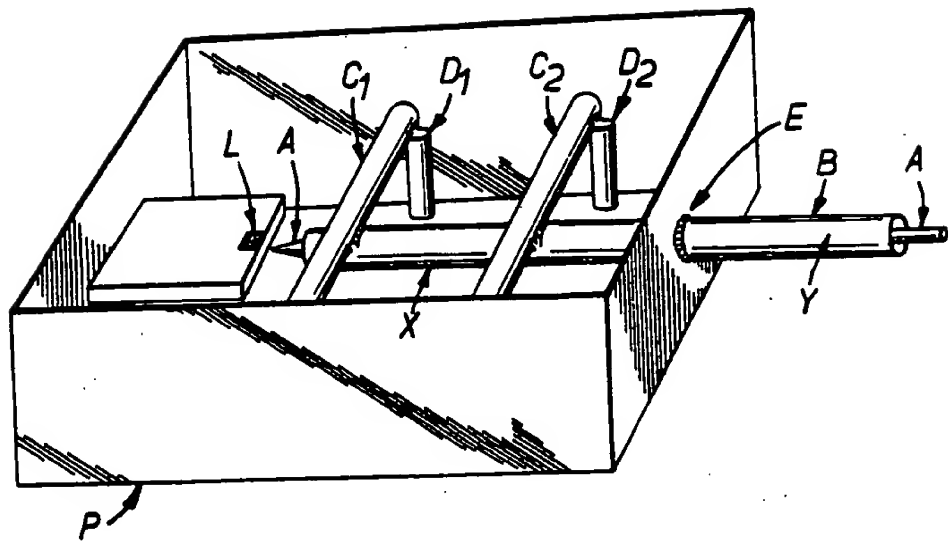

SPECIFICATION

Positioning devices

The present invention relates to a positioning device and more particularly to a device for positioning on optical fibre accurately with respect to an opto-electronic device.

The present invention is particularly suited to the alignment of monomode fibres to solid state lasers and it is an object of the present invention to provide an accurate alignment means for aligning an optical fibre to a solid state laser or another opto-electronic device, which means is suitable for use in hermetically sealed environments.

According to the present invention there is provided a positioning device for positioning an optical fibre with respect to an opto-electronic device in which the opto-electronic device is fixed to a substrate and in which one or more support members are positioned across the optical fibre such that when the optical fibre has been positioned accurately with respect to the opto-electronic device it is secured to the one or more support members. Preferably the support members are metallic bars and the optical fibre is supported within a metallic tube which is soldered to one or more support members.

The metallic tube may be soldered to two support members in a first embodiment or to a single support member and to the wall of an enclosure for the substrate in a second embodiment.

In said second embodiment the wall of the enclosure for the substrate may be provided with an oversize hole for the metallic tube, final positioning of the tube being obtained by movement of the tube within the oversized hole prior to securing the tube in the hole preferably b soldering or welding.

In a particular embodiment the optical fibre is a monomode fibre which is attached to the metal tube by soldering and the opto-electronic device is a solid state laser.

Embodiments of the present invention will now be described with reference to the accompanying drawing which shows a solid state laser in alignment with a monomode optical fibre. To align monomode fibres to solid state lasers the fibre tip must be positioned to micron accuracy in three dimensions. Commercial requirements are for rigidity, non-creep characteristics, and solvent free fixing methods suitable for hermetically sealed packages. Soldering techniques appear to be the most acceptable method of fixing the fibres, but it is necessary to overcome some of the drawbacks to using solder. Since soldering is essentially a high temperature process it is necessary to keep heat away from the heatsink and laser which for correct alignment must be working as a laser at not above room temperature. Secondly there is considerable thermal contraction of solder during solidification so the amount of solder must be minimised.

This invention seeks to nullify these effects by moving the soldered joints away from the fibre tip and to allow for positional adjustment after soldering.

In its present form the optical fibre (A) either cleaved or lens ended is suitably sealed with a soldering technique into a rigid small diameter tube (B) which has one or more crosspieces (C) welded or brazed to it along its length. These crosspieces are soldered to mounting pins (D) on the metal package (P) or on a substrate on which the laser (L) is mounted, the substrate being rigidly secured to the metal package (P) whilst the metal tube (B) is held rigidly in position by a micro-manipulator holding the tube at or about the point X such that the fibre is in such a position to obtain the maximum coupling with the laser (L). After the first soldering the micro-manipulator is removed to a point (Y) and any small misalignment corrected using the crosspiece (C_1) as a pivot. When maximum coupled power is again achieved either the second crosspiece (C_2) is soldered to supporting pins, or the metal tube is soldered directly to the package at the exit point where a slightly oversize hole is provided to allow small movements. It has been found in practice that either technique is suitable.

The advantages of this invention are that there is an absence of solvent or epoxy resins making the technique suitable for hermetically sealed packages. The alignment can be accomplished relatively quickly by the soldering technique and fine adjustment can be provided following the first soldering. The alignment can be carried out with the laser running because no heat is transferred to the laser. The completed structure is extremely rigid and robust and can be designed to fit most packages.

CLAIMS

1. A positioning device for positioning an optical fibre with respect to an opto-electronic device in which the opto-electronic device is fixed to a substrate and in which one or more support members are positioned across the optical fibre such that when the optical fibre has been positioned accurately with respect to the opto-electronic device it is secured to the one or more support members.

2. A positioning device as claimed in claim 1 in which the support members are metallic bars and the optical fibre is supported within a metallic tube which is soldered to one or more support members.

3. A positioning device as claimed in claim 2 in which the metallic tube is soldered to two support members.

4. A positioning device as claimed in claim 2 in which the metallic tube is soldered

to a single support member and to a wall of an enclosure within which the opto-electronic is positioned.

5. A positioning device as claimed in claim 4 in which the wall of the enclosure is provided with an oversize hole for the metallic tube, final positioning of the tube being obtained by movement of the tube within the oversized hole prior to securing the tube in the hole.

6. A positioning device as claimed in claim 2 in which the optical fibre is a mono-mode type which is attached to the metallic tube by soldering.

7. A positioning device as claimed in claim 1 in which the opto-electronic is a solid state laser.

8. A positioning device substantially as described with reference to the accompanying drawing.

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